COMPARATIVE ECONOMIC STUDY ON DAIRY FARMING IN SOME SELECTED AREAS OF BANGLADESH

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ABSTRACT

Dairy development through Field Fertility Clinic (FFC) is relatively a recent effort in Bangladesh. Farmers in the FFC areas are increasingly becoming interested in raising dairy cows. This paper is an attempt to examine the relative profitability of raising dairy cows by FFC members and non-members control farmers. The study revealed that annual average milk production per farm was 10075.32 litres and 8662.56 litres for FFC member and non-member control farmer respectively. In the case of FFC member farmer net return per farm was US $ 852.44 while in the case of non-member control farmer. The member was US $ 747.13. Return from per FFC member farm was higher by US $ 105.31 than the non-member control farm. The net change of dairy income from a farm was observed to be US $ 407.22 and US $ 205.90 due to introduction of FFC veterinary services and recommended feeding practice respectively. It has been found that using the FFC veterinary services the net change of farm income was higher (US $ 407.22) than the FFC recommended feeding practice. Cobb-Douglas production function analysis was done to determine the effects of variables mainly for concentrate cost (X_1), rice straw cost (X_2), green grass cost (X_3), labour cost (X_4), veterinary services cost (X_5) and FFC intervention (D) on milk return. The finding suggested all of the selected variables had significant impact on milk return. It was further observed that all the resources except rice straw were used efficiently.

Key Words: Field Fertility Clinic & Dairy

INTRODUCTION

Bangladesh is an agricultural base country of which livestock sector is the prominent sector. The contribution of livestock sector in GDP was 2.95 percent and growth rate was 7.23 percent in the year of 2005-06 (Economic Survey, 2006). Livestock has an important role to play in the economic development of Bangladesh, particularly in the dairy development sector. The private entrepreneurs mainly operate the dairy sector in Bangladesh. The rural households produce most of the milk and majority of them have one or two dairy cows (Raha, 2003). Most of their dairy cows are used for both milk production and draught purposes. There are some milk pocket areas where dairy farming has been traditionally an important and major component of mixed farming system. These areas are particularly located in the districts of Pabna, Sirajgonj, Manikagonj, Munshigonj, Faridpur, Madaripur, Rangpur, Tangail, Kishoregonj, Khulna, Satkhira and Chittagong (Raha, 2003). In these areas, some farmers keep dairy cow only for milk production.

Milk production increased from 1.29 million tonnes in 1987-88 to 1.74 million tonnes in the year 2001 of which approximately 90 percent is from cows and the rest 10 percent is from goat and buffaloes (Miah and Mandal, 2002). Due to increased production, milk powder import has decreased from 72 million US $ to 61 US $ in the period from 1990-91 to 2002-03 (BB, 2003).

The current domestic milk production is inadequate to meet the demand. The per capita availability of milk was 41.2 ml/day in 2000 against the requirement of 250ml/day (Miah and Mandal, 2002). Milk production in Bangladesh needs to grow by 4.2-5.6 percent per annum to meet up the increased demand against at 1.48 percent population growth by 2010.

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Given the prospect of such a high growth rate in dairy, there is a potential opportunity for recruitment a large number of smallholder producer's and other involved in milk processing and marketing. Dairy sub-sector generates more regular cash income and dairy production; processing and marketing generate more employment than the crop sub-sector (Asaduzzaman, 2000; Omoro et al. 2000).

The veterinary services are not adequate to maintain the growth of livestock population especially the dairy farms in Bangladesh. Considering the above issues, in collaboration with of government livestock department called Department of Livestock Services (DLS), Field Fertility Clinic (FFC) has been established in some of the milk pocket areas to support the smallholder dairy farms to uplift the livelihood of the rural people funded by United States Department of Agriculture (USDA). This study is a modest effort to find out the impact of FFC to smallholder farms in the selected areas of Bangladesh.

Field Fertility Clinic (FFC) has been developed through USDA Funded Project (BG-ARS-109) for improving veterinary services in the private sector. Individual farmers can neither buy the veterinary services nor get access in the formal milk marketing. Bangladesh Milk Producer's Cooperatives Union has shown their success on cooperatives for delivering services and marketing of milk. Field Fertility Clinic (FFC) implemented veterinary services and recommended feeding practices through farmer's cooperatives/associations. The cooperative has been empowered so that they, by pooling their produces for a market push, become enabling to manage milk marketing and purchase the FFC services. The main objective of this paper is to examine the impact of FFC on going income through ensuring veterinary services for the dairy cattle of FFC members and non-members control farms in the selected areas.

The specific objectives this paper is as follows:
1. To determine and compare the profitability of dairy raising by FFC members and non-members control farmers.
2. To examine the income potentials of FFC activities by using partial budgeting technique.
3. To determine the efficiency of various inputs used in rearing dairy cows.

METERIALS AND METHODS

Eight adjacent villages were purposively selected from Sirajgonj and Pabna districts of Bangladesh where the Field Fertility Clinic (FFC) was in operation. A total of 260 sample household were selected randomly, of which 200 households, one hundred from each district, received FFC services, i.e., members of FFC. The remaining 60 households, 30 from each districts, served as control. The survey schedule was designed in accordance with the objectives of the research. A preliminary schedule was drafted, pretested in the study areas and modified accordingly.The first author personally interviewed the head of the family and filled in the survey forms during the period from April to June 2005. If any information was overlooked or found contradictory, a follow-up farm visits were made to obtain correct data. Data analysis is the main function of an economic research or farm survey. Raw data was properly summarized, tabulated and analyzed. For this study, the following techniques were used.
Profitability analysis
The cost and return analysis was done on both variable and total cost basis. Total cost consisted of feeds cost, labour cost, veterinary services cost, housing cost, dairy supplies cost and cost of operating capital. Returns from the dairy enterprise included the returns from milk, cowdung, inventory change and bonus from cooperatives. The following profit equation was used to assess the profitability of the FFC member and control farms.

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$$\Pi = P_m Q_m + P_1 Q_1 + P_2 Q_2 + P_3 Q_3 + P_4 Q_4 - \sum (Px_i . X_i) - TFC$$

Where Π = Profit per farm   TFC= Total fixed cost
P_m = Unit price of milk Q_m = Quantity of milk

P_1= Unit price of cowdung Q_1= Quantity of cowdung

P_2= Average price of inventory change Q_2= Inventory change

P_3= Bonus per liter Q_3= Quantity of milk

Px_i= Per unit price of ith variable inputs X_i= Quantity i^{th} variable inputs

Partial budgeting analysis
The net change of profitability of dairy farms due to acceptance of FFC veterinary services was calculated. Here it was considered that there was a dairy farm of which producing milk in the study areas, previously traditional system such as; traditionally practiced veterinary services, conventional feeding practice for milk production. We examined the net change of farm income due to the introduction of FFC veterinary services by replacing the traditionally practiced veterinary services. The FFC veterinary services not only take care of disease prevention and emergency animal health problems but also educate farmers on animal feeding, breeding and housing sanitations on schedules farm visits. The traditional veterinary service on the other hand only takes care of emergency animal health problems.
We also examined the net change of income in farms that used FFC-recommended feeding practice in exchange of conventional feeding practice. The FFC personnel calculated the level of milk production and intake and estimated total dry matter, protein and energy intake and made recommendations on the required amount of rice straw, green grass and concentrate.

Resource use efficiency analysis
To determine the effects of selected inputs on the production of milk, Cobb- Douglas production function was chosen on the basis of the best fit. Six important independent variables namely, concentrate cost (X_1), rice straw cost (X_2), green grass cost (X_3), labour cost (X_4), veterinary services cost (X_5) and FFC intervention (D) were considered to have an impact on production of milk. FFC intervention of farmers was considered as dummy variable. The values of all the variables except the dummy variable were expressed in terms of US$ per farm. Incase of FFC intervention dummy, 1 was assumed for those farmers who used FFC intervention (feeding and veterinary intervention) and 0 for those who did not use FFC intervention in their farm. The relationship between inputs and output were illustrated by production function. In the study one equation was used to identify this relationship. The generalized specification of the Cobb-Douglas production function was:

$$Y = aX_2^{\beta_2} X_3^{\beta_3} X_4^{\beta_4} X_5^{\beta_5} D_6^{\beta_6} e^u$$

The function was linearised by converting the variables into logarithmic form. Thus the empirical specification of the function was as follow:

ln Y = a + B_1 ln X_1 + B_2 ln X_2 + B_3 ln X_3 + B_4 ln X_4 + B_5 ln X_5 + B_6 D + u

Y = Value of milk yield (US$/Yr.)   a = Constant / intercept
X_1 = Concentrate cost (US$/Yr.) X_2 = Rice straw cost (US$/Yr.)
X_3 = Green grass cost (US$/Yr.) X_4 = Labor cost (US$/Yr.)
X_5 = Veterinary services cost (US$/Yr.)
D = FFC intervention dummy; 1 = For FFC intervention and 0 = for non-FFC Intervention

To accomplish the objective of profit maximization i.e., for efficient allocation of resources, one should use more of the resources so long as the value of added product is greater than the cost of added amount of input allocate for producing it. The resources are considered to be efficiently used when the ratio of marginal value product (MVP) to marginal factor cost (MFC) approaches one, or in other word, MVP and MFC for each input are equal to one. The standard way to examine such efficiency is comparing MVP with MFC. The optimum use of a particular input would be ascertained by the condition of equality of MVP and MFC, i.e.,

$$\frac{MVP\ Xi}{MFC\ Xi} = 1$$

The MVP of a particular resource represents the addition to milk yield in value terms resulting from an addition of one unit of that resource while other inputs are held constant. The most reliable, perhaps the most useful estimate of MVP is obtained by taking resources (Xi) as well as gross return (Y) at their geometric means. Since the five variables of the regression model were measured in monetary value, the slope coefficients of those explanatory variables in the function represented the MVPs, which were calculated by multiplying the production coefficient of given resources with the ratio of geometric mean (GM) of milk yield in value terms to the geometric mean (GM) of the given resources, i.e.,

$$InY = a + bi\ lnXi$$

$$\frac{dY}{dXi} = bi\ \frac{Y}{Xi}$$

Therefore, $MVP\ (Xi) = bi\ \dfrac{\overline{Y}\ (GM)}{\overline{Xi}\ (GM)}$

Where,

Y = Mean value (GM) of milk yield in US$

Xi = mean value (GM) of the variable input in US$

i = 1,2,3,4 and 5

GM= Geometric mean; and

$\dfrac{dY}{dXi}$ = Slope of the production function is as well as MVP of ith input.

RESULTS AND DISCUSSION

The costs and returns were determined to find out comparative profitability of dairy raising by FFC members and non- members control farmers. The total annual costs and returns per household of raising dairy cows by FFC members and non-members control farmers are presented in Tables 1. Average per farm cost was higher for the member of FFC than that of non-member control farmers. In average annual milk production in FFC members farms was higher than that of non-member control farms. The returns from milk, cowdung, bonus, inventory change were higher for FFC member than non-member control farmer. The annual net return per farm was higher in FFC members farms than control farms. The FFC interventions caused an increased cost of US$ 317.39 but resulted in a gross return of US $ 422.7 per farm. The net per farm increased return was US$ 105.31equals to 12.35 percent.

Table 1. Comparison in annual costs and returns of a dairy farm between FFC members and non-members control farmers

Contents	FFC member farmers	Non-member control farmers	Difference	
			Absolute	%
Costs (US $) per farm				
Feed	1699.30	1482.50	216.8	12.75
Labour	333.40	301.87	31.53	9.45
Veterinary services	63.99	48.51	15.48	24.19
Dairy supplies	7.38	5.96	1.42	19.16
Housing	30.95	28.78	2.17	1.16
Capital	186.62	146.37	40.25	21.56
Interest on operating	74.20	64.46	9.74	13.13
Total costs	**2395.84**	**2078.45**	317.39	15.27
Return per farm				
Milk production per farm (litre)	10075.32	8662.56	1412.76	14.02
Return from milk sale (US$)	2392.89	2019.14	373.75	15.61
Return from cowdung (US$)	196.64	176.18	20.46	10.41
Bonus from milk (US$)	131.06	121.94	9.12	6.96
Return from inventory change (US$)	527.69	508.32	19.37	3.67
Gross return per farm (US$)	3248.28	2825.58	422.7	13.00
Net return per farm (US$)	852.44	747.13	105.31	12.35

Feed cost of raising dairy cow by member farmers were higher than that of non-member control farmers because the former category of farms used to feed their animals relatively more concentrate feed and green grass. Labour cost of the farmers was also higher because they had to more take care of their cows. The results of this study showed that there was a wide range of variations in returns, specially returns from milk while a minor variation in costs between member and non-member farms of Field Fertility Clinic (FFC).

In Table 2, it can be found that only US$ 48.51 was required for traditionally practiced veterinary services when feed cost remains constant. This amount of money was saved due to introduction of FFC veterinary services and cost incurred for introduction of FFC veterinary services was US$ 63.99. The total return from the traditional farm was US$ 2825.58 where FFC followed farm was US$ 3248.28. This additional return was possible due to FFC veterinary services. Thus, the net change of dairy income from a farm was observed US$ 407.22 due to introduction of FFC veterinary services.

Table 2. Partial budgeting for traditional practice veterinary services to FFC veterinary services

Costs	(US$) / farm	Benefits	(US$)/farm
1. Cost incurred for FFC veterinary services	63.99	3. Cost save for not using traditional practice veterinary services	48.51
2.Revenue forgone not using traditional practice veterinary services	2825.58	4.Revenue earned for using FFC veterinary services	3248.28
Net change	407.22		
Total	3296.79	Total	3296.79

It has been found from Table 3 that US$ 1482.50 was spent for conventional feeding practice when the veterinary costs remain constant in this situation. The cost of US$ 1699.30 was incurred for using FFC recommended feeding practice. The additional return was found due to practice of FFC recommended feeding practice. Thus an additional net change of income was found US$ 205.90 by which farmers were benefited by introducing only FFC recommended feeding practice in their farming.

Table 3. Partial budgeting for conventional feeding practice to FFC recommended feeding practice

Costs	(US$)/farm	Benefits	(US$)/farm
1.Cost incurred for using FFC feed management	1699.30	3. Cost save for not using traditional feed management	1482.50
2. Revenue forgone for not using traditional feed management	2825.58	4. Revenue earned for using FFC feeds management treatment	3248.28
Net change	205.90		
Total	4730.78	Total	4730.78

Applying partial budgeting technique, it has been observed that the farmers were benefited in all aspects of introduction of FFC services. It has been found that using the FFC veterinary services the net change of farm income was higher than the FFC recommended feeding practice.

Cobb-Douglas production function was applied on the basis of the best-fit and significant effects of resources on milk return. Concentrate cost , rice straw cost, green grass cost, labour cost, veterinary services cost and FFC intervention (D) were considered as crucial independent factors which are likely to have an impact on milk return.

The effect of concentrate cost (X_1), rice straw cost (X_2), green grass cost (X_3), labor cost (X_4), Veterinary services cost (X_5) on milk production was positive and significant ($p<0.05$). It indicated that keeping other factors constant, 1 percent increase in additional expenditure on concentrate feed cost , rice straw cost (X_2), green grass cost (X_3), labor cost (X_4), Veterinary services cost (X_5) would increase the return of milk by 0.638, 0.088, 0.064, 0.206, 0.010 percent respectively. The co-efficient of the variable of FFC intervention dummy for dairy cow was statistically significant at 5 percent level. This implies that gross return increased by 0.047 percent where FFC intervention was made. The co-efficient of multiple determination, R^2 was 0.894 for dairy cow, which indicated that about 89 per cent of the variations in milk yields were explained by the independent variables included in the model. The F-value of the equation was highly significant at 1 percent implying that all the variation in milk yield depends mainly upon the explanatory variables included in the model. The sum of all the production function co-efficient (production elasticity) of the equation for dairy cow was 1.053, which exhibited increasing returns to scale for dairy cows.

The standard way to examine the efficiency of resource allocation is to compare marginal value product (MVPs) with the marginal factor cost (MFCs) of each variable input. Table 5 shows that the ratios of MVP and MFC of concentrate feed cost (X_1), green grass cost (X_3), labor cost (X_4) and veterinary services cost (X_5) were positive and one greater than unity of dairy farming, indicating that more profit may be obtained by increasing the use of these resources. The ratio of MVP and MFC of rice straw cost (X_2) was positive but less than unity which implies that these resources was used more than optimum level and hence a downward adjustment was needed to bring it closer to unity.

FFC intervention had a positive effect on milk return. As a result, gross return positively influenced by FFC intervention. There was an over use of rice straw though all the other variables also had significant positive effect on milk production.

Table 4. Estimated value of co-efficient and related statistic of the Cobb- Douglas production function.

Variable/ Parameters	Co-efficient	T-value
Intercept	1.337**	2.372
Concentrate cost (X_1)	0.638*	15.373
Rice straw cost (X_2)	0.088**	2.179
Green Grass cost (X_3)	0.064*	3.042
Labor cost (X_4)	0.206*	2.812
Veterinary services cost (X_5)	0.010**	2.030
FFC Intervention Dummy (D)	0.047**	2.219
R^2(adjusted)	0.889	-
F-value	165	-
Return to scale	1.053	-

Note: * Significant at 1 % level , **Significant at 5% level

Table 5. Ratio of marginal value products (MVPs) and Marginal factor costs (MFCs) of different input.

Inputs	Geometric mean	Co-efficient	MVPs	MFCs	MVP/MFC
Return(Y)	141253.29				
Concentrate feed (X_1)	62736.58	0.638	1.44	1	1.44
Paddy straw (X_2)	14307.07	0.088	0.87	1	0.87
Green grass (X_3)	792.64	0.064	11.22	1	11.22
Human Labor (X_4)	20589.30	0.206	1.41	1	1.41
Veterinary cost(X_5)	1089.33	0.010	1.30	1	1.30

The scope of using green grass largely demanded which indicated for strengthening feeding intervention specifically through green grass by FFC. Based on the results of this study, the following conclusions may be drawn:

- After intervention of FFC services total milk production, total return and net return per farm have been increased which indicated the positive impact for dairy development in the study area.
- After using the FFC services the net change of farm income has been increased.
- FFC intervention was found effect a positive on total return from milk production.

REFERENCES

Asaduzzaman, M. (2000), Livestock Sector, Economic Development and Poverty Alleviation in Bangladesh. In: Mandal, M.A.S.(Ed.), Changing Rural Economy of Bangladesh. Bangladesh Economic Association, Dhaka. pp. 42-53

Bangladesh Bank (2003), *Annual Import Payment*, Statistics Department of Bangladesh Bank.

Miah, M. M. A., Mandal, M. A. S. (2002), Smallholder Dairy Production in Peri- Urban Areas of Bangladesh: Empirical Findings and Policy Implication. In: Proceed. Workshop Policy and Institutional Factors Affecting Poultry and Dairy Producers in Bangladesh, Dhaka 13-14 October, 2001. pp.1-17

Omore, A. et.al.(2002), Employment Generation through Small-scale Dairy Marketing and Processing: Experience from Kenya, Bangladesh and Ghana. FAO, Rome, Italy. p.22

Raha, S. K and R. K. Talukder (2003), Vertical Integration in the Dairy Sector in Bangladesh- A Case Study of Bangladesh Milk Producers' Co-operative Union Ltd. Paper Presented at the Regional Seminar of the Bangladesh Economic Association on Promotion of Agri-bussiness and Agro-processing in Bangladesh, Held on 17 December, 2003 at BAU, Mymensingh.